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ABSTRACT

The introduction of Drexel University's microcomputing program, which provides students access to this technology for coursework, is described, with attention to the groups who played a major role in preparing the university. Faculty helped set the initial direction of the program and have been central to its operation. Other faculty roles included review of the computing needs of students and faculty and the characteristics of microcomputers that were on the market in fall 1982, program planning, communicating among departments, and developing ideas and materials to enhance the academic curriculum. Students have provided feedback and have identified problem areas and need for new services. Software academic applications developed by students and student-led orientation programs for new students are additional student inputs. The involvement of the following groups is also discussed: the business units of the university, the facilities committee, the computer center, the instructional support group, the user support group, the equipment support group, and the microcomputing program's management team. Future concerns are also identified, including local area networks, getting software to students economically, and the distribution of software developed by the Drexel community. (SW)

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THE MICROCOMPUTING PROGRAM
AT DREXEL UNIVERSITY

ORGANIZING THE PROGRAM

THE LOGISTICS INVOLVED IN INTRODUCING MICROCOMPUTING AT DREXEL UNIVERSITY

In the fall of 1982, Drexel University decided to introduce a dramatic, new educational program for the 1983-84 academic year. The new program, which is presently underway, requires every freshman to have access to a personal computer for use in courses ranging from the sciences to the humanities.

The goal of this comprehensive program is to provide Drexel students with the resources and training necessary to meet the challenges of the future...a future in which effective use of computers will be essential in virtually every field.

While Drexel certainly does not intend to make all its graduates computer scientists, it does seek to create an environment in which students learn about computers and become comfortable working with them as part of their regular coursework. The kind and degree of computer proficiency required will depend upon the student's academic concentration. Some will need to gain competency in one or more programming languages and environments; others will need to master a variety of application packages. In all cases, however, the emphasis at Drexel will be on using the computer as a powerful tool for exploring concepts and doing work.

INTEGRATING THE PARTICIPANTS

The Microcomputing Program at Drexel University is a cooperative effort which draws upon the resources of a variety of support groups. This document will attempt to describe the nature of the groups involved and to explain the network of interdependences which were created among them in order to facilitate the program.

A number of distinct groups played a major role in preparing the University for the introduction of microcomputers:

- Faculty
- Students
- Business Affairs Units of the University
- Facilities Committee
- Computer Center Staff
- Instructional Support Group
- Micro Users Support Group
- Equipment Support Group
- Microcomputing Program's Management Team

Although these groups were independent units with independent tasks to perform, they also worked together and were fully aware of their role within the larger context of the program. As a result, partnerships were created which spurred the development of new communication networks on campus. These communication networks continue to play an important role in the present functioning of the program.

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FACULTY INVOLVEMENT

Faculty involvement in the microcomputing effort has been extensive and varied. Faculty helped set the initial direction of the program and have continued to be central to the most important aspects of its operation. Three faculty committees have played key roles in the Microcomputing Program at Drexel: the Selection Committee, the Users' Committee, and now the Faculty Advisory Committee.

Soon after the decision to introduce microcomputers was announced a faculty committee was organized to determine how the machines should be used and what capabilities they should have. (The process of selecting the machine is described in detail in a separate document in the Drexel Microcomputing series, "Choosing the Machine: The Selection Process at Drexel University.") The Selection Committee reviewed the computing needs of students and faculty and examined them against the specifications of virtually all microcomputers which were on the market in the fall of 1982, or were being prepared to go on the market.

While the Selection Committee was conducting its review of equipment, an all-university Users' Committee was being created to identify other concerns and needs that the institution should consider in implementing the program. The Users' Committee consisted of about 15 members who were representative of all the colleges in the University. For the most part, these were experienced computer users. Several were sophisticated programmers as well. This committee identified logistical as well as academic support and service needs. In this way, they helped in program planning and smoothing out the implementation process. The committee also helped frame new policies dealing with such issues as a copyright policy and departmental allocation of hardware resources.

Most recently a Faculty Advisory Committee has been set up to facilitate communication among the individual colleges within the University and between them and the program's administration. This new committee consists of six college liaisons, each representing one of the six Drexel colleges and each appointed by the Dean of his or her college. These individuals are designated to serve as prime sources of information about the program and as conduits for faculty input as the program further decentralizes and becomes more directly controlled at the departmental and college levels. Members of the Faculty Advisory Committee are also charged with the responsibility of offering recommendations on software that should be obtained for academic programs, of helping to facilitate software development and the cross-development of materials, and of engaging in ongoing communication with all members of their respective colleges, from the relatively naive user to the technical sophisticate.

One of the most important contributions by faculty to the Microcomputing Program has been in the development of ideas and materials to enhance the academic curriculum. To foster contributions in this area, the University received a $2.8 million grant from the Pew Memorial Trust, which has made possible a variety of resources for faculty development in this area.

A general description of the faculty development effort is presented in a separate document in this series, "Preparing the Faculty: Faculty Development for the Microcomputing Program."

During the first year of the Pew grant, more than 250 of the 350 full-time faculty attended on-campus classes and seminars, over 60 went to conferences, and 80 were given release time and programming assistance to develop software and courseware. The investment in faculty has been substantial, but the pay-off has been equally great. Of all the groups that have been involved in the Microcomputing Program, the faculty has been the most important in defining its direction and priorities. This overall faculty development effort was directed by the **Faculty Development Coordinator**, a senior faculty member who also serves as a central figure on the Microcomputing Management Team (see below).

STUDENT INPUT

Student participation in the Microcomputing Program was encouraged from the beginning and this input is expected to become more valuable as the program continues. Before machines were actually introduced on the campus, a Student Advisory Committee was established to offer ideas and opinions relating to overall program objectives. This group continues to act as a source of feedback to the administration by identifying problem areas and suggesting the need for new services. This student group also provides input on policies that will affect the student body and acts as a communication link between the program's staff and the student user community. The Student Advisory Committee has also planned and begun implementation of several activities and projects. Among these is a student software competition which will focus on academic applications developed by students.

Student input also comes from a student user group formed on campus. The DUsers were formed shortly after the microcomputers were introduced on campus and the group has since been active in publicizing information of interest to student users. The DUsers also assist in student training. For example, they are presently involved in planning an orientation to the machines for incoming freshmen, and they are organizing a microcomputer fair to be held on campus next year. Participation of the DUsers has added a lively dimension to the program and has helped reduce the need for formal University services in some areas.

INVOLVEMENT OF THE BUSINESS UNITS OF THE UNIVERSITY

The Microcomputing Program at Drexel was primarily an academic initiative, but, not surprisingly, it has also required a great deal of support from the business affairs units of the institution. From the outset, a variety of financial matters which clearly fell under the jurisdiction of the business units of the university needed to be handled in close coordination with the program's Director and staff. Some of the matters which required this kind of coordination are discussed below.

In order to ease the financial burden on students, a bond was issued which enabled the University to make a volume purchase of computers and then resell to students. The bond issue also enabled the University to assist students who could not pay the entire price of their machines at one time by giving them the option of paying for their machines over the course of their undergraduate education at an interest rate well below the market rate. The University further reduced the student's financial burden by including the cost of the computer in calculating the student's basic financial requirements for purposes of financial aid requests. Considerable administrative effort went into facilitating the bond issue, the mass purchase, and options for student financing of these purchases.

Another major task of the business units during the start-up phase of the program was to obtain necessary insurance coverage for the machines. Drexel's program allows each student to purchase one and only one computer at the discounted price. This means that the purchase of any replacement machine must be made from an outside vendor. Since the retail price of the machine and software is nearly three and a half times greater than the price Drexel charges its students, insurance for replacement value became an essential concern. The University was able to arrange an insurance program, available to all students at a nominal cost, which provides for complete replacement value of the computer if it is stolen.

Other business aspects attached to the distribution of the microcomputers included recording of serial numbers of all component parts, filling out and signing of a variety of receipts and warranty cards for each machine, calculation of sales tax, and generation of student bills. In short, many details had to be handled in a professional and efficient manner and in close coordination with other administrative units of the University.

There are additional business dimensions to a program of this kind that need not be discussed in detail but that are of great importance to any school considering such a move. Among these are an increase in volume of purchases for the bookstore as well as an increase in volume of university purchasing in general. Inventory issues affect cash flow, and a host of contractual issues regarding software and hardware have to be carefully reviewed. These logistics are not so monumental as to be insurmountable, but they do require careful planning and the full support of the business affairs units of a university.

THE FACILITIES COMMITTEE

The introduction of microcomputing on campus radically altered the University's physical plant. New laboratories, print areas, and a warehousing unit were only some of the facilities needed for the program. In order to coordinate these and other additions and renovations, a Facilities Committee was charged with anticipating the need for new and expanded facilities and with evaluating existing facilities. The committee consisted of the following members:

- Director of the Microcomputing Program
- Director of the Physical Plant
- Director of Planning and Construction
- University Architect
- Manager of the Equipment Support Group
- Director of Residential Living
- Manager of Academic Computing
- Dean of Students
- University Comptroller
- Director of Campus Security

The Committee sought to integrate ideas and opinions from all segments of the University community, however disparate their viewpoints and interests might be. In the end, each of the parties involved succeeded in making a unique contribution to the planning process. It is useful to examine the implications and concerns of each of these areas in order to capture some of the complexity of such an undertaking.

The **Director of the Microcomputing Program** was responsible for the overall coordination, implementation and planning of the microcomputing effort. Since this individual also served as Assistant Vice President for Academic Affairs, he was able to make decisions which took into account the larger academic needs of the University.

The **Director of the Physical Plant** was concerned with basic support of all facilities. Many of the buildings in which computers were to be housed required special heating and air conditioning units as well as the usual general support and maintenance. Moreover, since much of the construction needed for the program was completed with Drexel labor, it was essential that timetables for the program and for the University as a whole were clearly understood by all concerned and that the constraints produced by competing personnel requirements were built into the overall planning process.

The **Director of Planning and Construction** provided assistance in planning facilities which could be altered or renovated as the needs of the program changed. In those areas, for example, where cabling was required, or where it was probable that local area networking would eventually be needed, facilities had to be constructed which could be adapted to meet future cabling needs.

The **University Architect** helped the University make optimal use of available space and enabled the program to develop extremely functional facilities.

The **Manager of the Equipment Support Group** had the responsibility for the overall logistical preparation and distribution of the microcomputers to students and faculty. For this task to be performed effectively, he had to gather extensive functional information about existing service-related facilities. His meetings with other members of the Facilities Committee expedited this process. In return, the Equipment Support Group Manager provided others in this group with information on technical specifications needed for construction of program-related facilities, such as the design of consoles to be placed in all large lecture halls on campus in order to permit large-screen video projection of the computer screen.

The **Director of Residential Living** provided input on the physical constraints and variables affecting introduction of microcomputers into the dormitories. Such issues as electrical wiring, the nature of dormitory furniture, and phone accessibility had to be considered.

The **Manager of Academic Computing** supplied background on existing computing facilities on campus and developed a blueprint for how the new facilities could be integrated into the existing system.

The **Dean of Students** supplied data on student-related policies and on student needs and concerns. The information provided by the Dean's office increased the committee's sensitivity to the kinds of problems that students might encounter as they began using the machines.

The **University Comptroller** compiled and interpreted the fiscal information that affected the planning process and, in general, served as representative of the business affairs units, whose cooperation was crucial to the service and distribution operations of the program.

The **Director of Campus Security** also played a crucial role. Not only did facilities have to be made secure, but a variety of issues relating to the security of individual pieces of equipment had to be considered. For example, Drexel was becoming a test site for hardware and software not yet released to the commercial market. This activity would provide a variety of security problems new to the University and for which Campus Security had to develop new security measures. Campus Security was also needed to assure the security of microcomputers stored by the University prior to their distribution and to assure the safety of students as they transported their newly purchased machines to their living quarters during the mass distribution period. Of all the logistical considerations relating to the program, security was probably the one which required the most attention.

THE COMPUTER CENTER

Before addressing the specific function of the Computer Center in the microcomputing program, it is first helpful to explain a fundamental change in the role of the Center as this program evolved. The Drexel Computer Center was traditionally a service bureau, providing assistance to individual faculty members and students and operating computer laboratories and other related facilities. But the microcomputing effort changed the role of the Center dramatically. Although it still maintains facilities and provides consulting, now it also offers the expertise of programmers and computer specialists who work hand-in-hand with faculty in the preparation of software. Instead of serving in a relatively passive support role, members of the Computer Center staff are now partners in the academic process, helping to influence the direction of software developments in specific course areas.

This partnership between the Computer Center staff and the teaching staff is important for a number of reasons. For one thing, many faculty are interested in using computer applications in their courses but do not have, or are not necessarily interested in acquiring, the programming skills to do so. The development team is the ideal solution, for it weds the academic expertise of the professor with the technical sophistication of the computer specialist. Because team participants approach a given problem from different vantage points, solutions they come up with by pooling their knowledge are usually better than anything individual participants could devise on their own. For example, when a faculty member presents a plan for developing a specific piece of software, a programmer, aware of some

nuance of the machine's operation, may suggest changes which will increase the elegance and/or efficiency with which that program can be run.

The Computer Center staff also helps faculty make efficient use of existing educational software. Much of the so-called educational software presently available is unsystematic, undocumented, and often not programmed in an efficient manner. Grappling with these software problems is best done by a professional staff who have the time and expertise to do so.

Within the organizational structure which supports the microcomputer program, the **Manager of Academic Computing** is responsible for all computing service as it relates to both undergraduate and graduate programs. He reports both to the Director of the Microcomputer Program and to the Director of the Computer Center. Although this dual reporting structure violates traditional organizational principles, it has allowed for coordination and minimal duplication of effort during the early implementation stages of the program.

The long-term plan is for the microcomputing effort to be incorporated into routine academic and Computer Center activities, thereby ceasing to be a separate structure. That goal, however, is not expected to be reached until some time in the future. At present, the demands of the program are such that several new support structures have had to be developed to accommodate it, including two recently created units: the **Instructional Support Group** and the **User Support Group.** Both report to the Manager of Academic Computing and have dual status, being part of the Computer Center staff as well as being key players in the Microcomputing Program.

THE INSTRUCTIONAL SUPPORT GROUP

The Instructional Support Group (ISG) is responsible for creating application packages, adapting generic packages for a specific application, and adapting or translating programs already in existence. ISG consists of approximately 25 programmers/consultants. Two of these are assigned to a general all-university support staff while the others are responsible for working with faculty members to assist in project development.

General support staff provide two basic functions: They serve as technical contacts for the development system currently needed for production of software for the Drexel microcomputers; and (2) they provide information on software products from outside developers which are available for faculty and staff review prior to their public release. In addition, they send and receive electronic mail between Drexel and other universities engaged in similar development efforts, and they play a primary role in consulting and training for faculty and other staff in the use of the development system.

ISG staff assigned to specific projects become familiar with the direction, needs, and objectives of individual projects and gain first-hand exposure to course content. They also serve as information links between the central staff and specific projects and, as such, assist in the cross-fertilization of techniques and methods across departmental and college boundaries.

One outgrowth of the centralization of software development within ISG has been the collection of information about software needs and newly developed products throughout the University. From this information, ISG has been able to accumulate a number of programs which can be used as basic utilities or "templates" by developers in unrelated fields. Some of these have been programmed specifically by ISG staff to meet project goals in a variety of different departments. Others have been culled from the development efforts of a specific project so that they can be used as 'building blocks' for development of new products. It is apparent that this process has served to increase the speed and quality of software development at Drexel.

Both ISG and the User Support Group (see below) have staffs made up of full-time professionals, cooperative education students from Drexel's own co-op program, and students who are currently taking academic coursework. Student help, whether it is full or part-time, is considered especially important in helping administrators and faculty gain a realistic view of the program's objectives. In addition to doing much of the basic programming, students contribute to both the style and content of individual projects by bringing insights and perspectives gained from their own recent experience as students in the very courses which these projects address. At the same time, students gain experience and knowledge which benefit them in their own coursework and, possibly, in their future careers.

THE USER SUPPORT GROUP

The User Support Group (USG) is the primary line of support for students and faculty. The USG acts as a first point of contact for campus users and has become the central source of information about the program. If USG staff consultants cannot solve a problem or answer a question, they are trained to make the proper referral.

USG staff provides walk-in consulting assistance at a number of sites on campus. Here consultants, each equipped with a microcomputer, are available to work through problems on a one-to-one basis. Students and faculty can also receive quick answers to software and hardware problems from USG staff via the computer "hotline," a phone consulting service operated 16 hours a day. USG consultants also maintain student and faculty access rooms where microcomputers are available for on-campus use. In addition, USG issues an assortment of user "tips" in both printed and disk format to assist the members of the Drexel community in better using their microcomputers.

USG staff also support the eight University "print stations," providing machine maintenance, technical support, and suggestions for more efficient printer use. (Since students are not required to purchase printers, print stations are areas in which clusters of printers have been installed so that users can print out the materials they have developed on their own computers.)

THE EQUIPMENT SUPPORT GROUP

The Equipment Support Group (ESG) was created to supply necessary technical assistance on hardware problems, service, repair, and security for all microcomputers owned by or bought through the University. They also handle distribution of computers and other peripheral equipment bought through the University.

ESG had primary responsibility for design and planning in the renovation of a 15,000 square foot building which now serves as the microcomputer warehouse and service and repair facility. This building also accommodates the on-site testing of all micro equipment to be distributed by the University.

ESG works closely with the Comptroller's office to establish and maintain a convenient process by which computers and other course-related hardware can be issued with a minimum of paperwork and logistical red tape. (During the first mass distribution of the microcomputers, 2300 machines were distributed in 6 days. The distribution was coordinated in such a way that it required less than 10 minutes per student to complete this process.)

The primary ongoing responsibility of ESG is to provide service and repair. When a university integrates microcomputing into all curricula, students and faculty come to depend on the machines; they cannot afford to have them out of commission and undergoing repair for an extended period of time. At Drexel, a staff of four trained repair technicians work to keep all machines operational. Thus far, this group has been able to make all repairs within 24 hours. ("In by 11am, out by 5pm" has been the norm.) ESG is certified to make all repairs under the initial 90-day warranty and the manufacturer's extended warranty policy. They will also provide service and repair on a fixed-cost basis to all those who have bought their equipment through Drexel but do not opt for an extended care policy.

And finally, ESG coordinates all security measures related to the Microcomputing Program. These include the maintenance of both physical and electronic security devices in special microcomputing facilities and throughout the campus. In addition, every machine issued by Drexel, regardless of whether it is owned by the University or by a student, is "hot stamped" with a Drexel "D" which identifies it as part of the Drexel program. ESG is responsible for the hot-stamping procedure.

THE MICROCOMPUTING PROGRAM'S MANAGEMENT TEAM

The Director of the Microcomputing Program is ultimately responsible for all aspects of the Microcomputing Program at Drexel University. He reports directly to the Vice President for Academic Affairs and is assisted by a management team consisting of eight persons who carry out the daily administration of the program and two advisory bodies, the Faculty Advisory Committee and the Student Advisory Committee. The program's management team was set up to integrate many of the tasks described above.

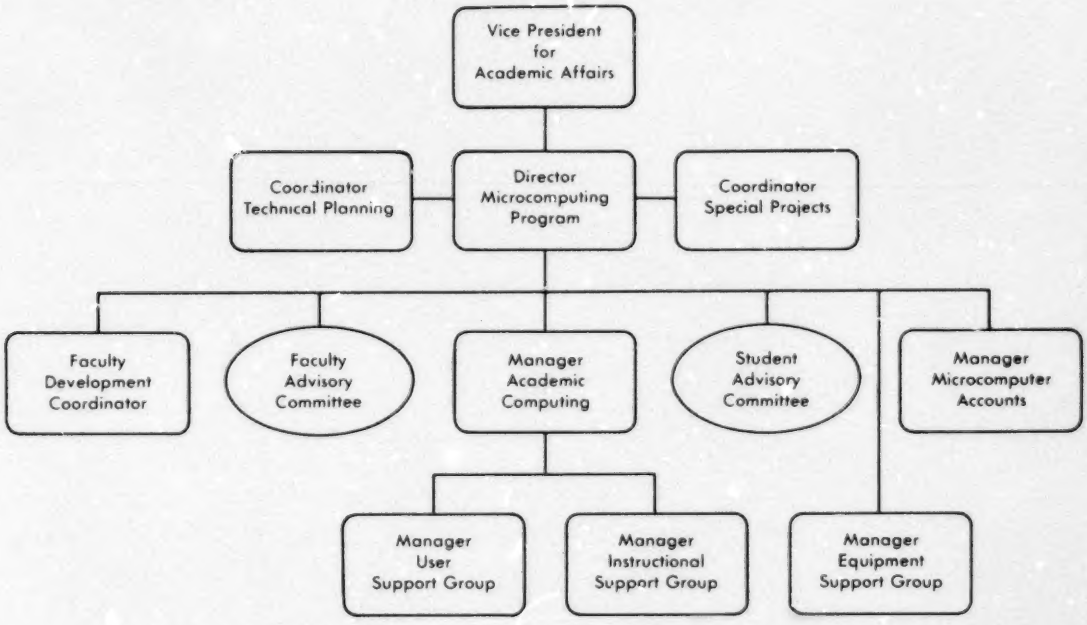
The eight individual members of the management team are responsible for virtually all administrative matters relating to the

microcomputing program. The team does research, solicits input, exchanges information, coordinates resources, assigns task responsibilities, and makes the decisions necessary for implementation on all levels. The roles and responsibilities of all but two of the members of this team have been described above. (The Manager of Microcomputer Accounts served also as Manager of the Equipment Support Group during the early stages of the program. However, when the number of microcomputers on campus approached 6,000, the accounting and equipment support functions were split.) The functions of the remaining two positions are as follows:

The **Coordinator of Technical Planning** is in charge of evaluating the technical needs of the program. The primary responsibilities of this position are to explore networking options, alternative delivery systems for printing, and establishment of computer-based laboratories.

The **Coordinator of Special Projects** is responsible for internal and external communication regarding the program. This person also handles general administrative aspects of training and development activities related to the program; coordinates projects on a variety of special topics; and assists in the development of policies and educational procedures related to the legal and ethical use of computers.

Organizational Chart for the Drexel Microcomputing Program



PREPARING FOR THE FUTURE OF THE PROGRAM

The extent of coordination and management currently involved in the Drexel program is certainly more elaborate than will be necessary in the future, either at Drexel or at other universities. However, since Drexel was the first school in the country to integrate microcomputing on such a large scale, there were few precedents and models available from which to work. The difficulty of being the first university to implement such a program was compounded by the necessity of having to conduct some of the arrangements in secret owing to nondisclosure agreements pertaining to the Macintosh, which was the computer selected for use in this program. Not until the Macintosh was officially announced by the Apple Computer Company could certain activities and information be made public.

Now that the program is well underway, and as the use of microcomputers on the Drexel campus gradually becomes a way of life, it is expected that the microcomputer management team and the whole centralized structure of the program will be gradually absorbed into the existing academic and Computer Center structures. This is not to imply that the need for special services and personnel to support the program will disappear. Rather, it is the organization and composition of these services that will change.

During this evolutionary process, new structures will be developed and existing ones will be adapted to meet changing needs. In 1988, when all classes are integrated into the program, it is projected that there will be more than 10,000 microcomputers on campus. Clearly, a program of this magnitude will require more support personnel and resources. Three aspects of the program will certainly need to be developed further in order to accommodate this growth.

The most immediate requirement will undoubtedly be in the area of networking. Local area networks in a variety of specialized classrooms are already being planned as are facilities and hardware to support dial-up access to databases, file access, and print stations. These developments, however, involve issues of access and control that must be carefully planned.

A second concern is the matter of getting needed software into the hands of students in the most economical manner possible. Internal development of software, institutional licensure, and bulk purchases are all options being explored and, in some instances, being negotiated. Copy protection of software is also being pursued aggressively at this time and will become of greater concern as software becomes more generally available.

Finally, issues surrounding distribution of software developed by members of the Drexel community must be carefully planned. The University is exploring distribution alternatives which will maximize the sharing of resources while protecting the rights of those who have developed materials and who stand to profit from the sale of their products. This includes not only faculty members but students and staff as well. Guidelines are needed to clarify which Drexel-developed software materials should be placed in the public domain and which should be distributed for profit in order to finance future development efforts.

The microcomputing effort at Drexel University has proven to be an exciting educational program, but one which required new mechanisms of institutional support. Publicity surrounding the program at Drexel has drawn literally hundreds of queries from other colleges and universities in this country and abroad. Our intent in this document is to provide specific information on the logistics and organizational structures which evolved during the early phases of the Microcomputing Program at Drexel. Our hope is that this information will encourage and assist other universities as they make their own transitions into a new educational era, one in which the microcomputer becomes a basic tool for all members of the academic community.

Although enhancement of the educational experience is certainly the primary goal of incorporating this powerful tool into the higher education process, such issues as security, facilities planning, distribution of resources, and the overall management and planning efforts must receive serious consideration if that primary goal is to be achieved.

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